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Appraisal and Consequences of Cadaver Dissection

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Abstract: First exposure to human cadaver dissection has the potential to be an actual stressor which can cause psychological trauma. This study examines the relationship between anatomy students' experience of this potential stressor and various psychological and personal factors. Questionnaires measuring emotional reactions to cadaver dissection, coping strategies, personality and attitudes to death were administered to anatomy students at two medical schools immediately after their first exposure to human cadaver dissection. Emotional reactions to recalling this experience were assessed 4 months later. Data on these variables were obtained from 141 students. Students found the experience mostly challenging and, on average, did not report serious emotional difficulties. However, a minority of students (10/141) experienced serious adverse consequences. It is possible that the typical student who undertakes an anatomy course is already psychologically prepared for such transactions. However, low cost desensitization programs could be made available for the minority of individuals who may experience adverse reactions in this situation.

Keywords: Cadaver dissection, stress, coping, personality

The experience of stress may be viewed as the culmination of a process which involves the perception and appraisal of "events" as positive, negative or neutral stressors. Transactional theories of stress¹ emphasize that stress experiences result from complex interactions between individuals and their environments. The outcome, therefore, of this appraisal can depend on, among other things, the personality characteristics of individuals and the particular environment in which they are situated. If a potential stressor is judged to be negative, a secondary appraisal takes place where an individual determines the extent to which the resources available to them are sufficient to cope with this negative experience. A perceived inability to cope (for whatever reason) will lead to a stress response which may be manifested in a physiological, cognitive, emotional or behavioral manner.

The stress outcome (the response to the stressor) is most often studied, because of the demonstrated physiological and psychological effects on the individual. For example, the stress experience has been associated with smoking relapse², alcohol consumption³, dietary behaviour⁴, number of accidents⁵, tumour growth⁶ and lymphocyte activity.⁷ However, it is clear from the transactional models that appraisal of the "stressfulness" of the situation, an appraisal of coping strategies available to the individual, and an appraisal of the coping strategies employed by the individual are crucial in determining the nature of the stress experience. This appraisal process,

and in particular primary appraisals, are often viewed as the "final common path" for behavioral and health outcomes.⁸ It is the appraisal process which is the focus of the present study.

Primary appraisal refers to the evaluation made by individuals of the nature and meaning of a particular transaction in relation to their well-being.⁹ A positive appraisal means that the individual perceives the transaction as challenging or beneficial and as an opportunity for mastery and growth. Transactions of this nature can contribute towards an improvement in psychological well-being. A negative appraisal means that the individual perceives the transaction as threatening (i.e., it has the potential for harm) and can result in a loss of health, self-esteem or other aspects of psychological well-being.

Until recently, measures developed to assess an individual's primary appraisal outcome demonstrated poor psychometric properties.⁸ The Appraisal of Life Events Scale (ALE) has good evidence of validity and reliability and is associated with health outcomes, dimensions of personality and coping behavior.¹⁰ This instrument examines three underlying dimensions of the primary appraisal outcome (threat, challenge and loss), thereby allowing the identification of transactions that the individual perceives as positive in addition to transactions perceived as negative.

Secondary appraisal refers to the evaluation by the individual of his/her coping resources. Coping can be defined as any response which occurs (normally over time) to avoid, confront, or otherwise manage a potentially stressful event. Coping strategies can be grouped into two general types: problem-focused coping and emotion-focused coping. Problem-focused coping refers to strategies that center on the situation and the conditions which may lead to the stress outcome; emotion-focused coping involves efforts to regulate emotions experienced because of the stressful event. Coping strategies can be adaptive or maladaptive and may also include escape, avoidance and denial strategies. The type of coping strategy employed depends on several factors.

The situation itself may influence the type of coping strategy used. For example, work-related problems most commonly lead to problem-focused coping efforts, whereas health problems can often lead to emotion-focused coping, such as seeking social support.¹¹ Individual differences are also important determinants of the coping strategy employed. Religion has been found to promote well-being and help people cope with stressful events;¹² primary appraisal outcomes and types of coping strategies employed have been shown to differ between males and females^{13,14} and between ethnic groups.¹⁵ There is an established association between personality and coping behaviour,¹⁶ and it has been suggested recently that the conceptual links between models of personality and coping are such that coping “trait complexes” should be identified rather than treating personality and coping as independent phenomena.¹⁷

In summary, the experience of an event by an individual results in a primary appraisal outcome of threat and/or challenge and/or loss. This outcome and the secondary appraisal of coping strategies are important predictors of the stress response (which may be manifested as feelings of anxiety, nausea, etc). Other factors which may influence the appraisal process are personality, religion, gender, ethnicity, and other factors specific to the situation.

The present study focuses on students who are exposed to a recognized potential stressor – first exposure to human cadaver dissection. Previous research has suggested that a large proportion of students (up to 30%) report adverse physical and psychological consequences of being introduced to this situation.^{18,19,20} It is suggested that the limited coping mechanisms used by students are effective in reducing the impact of their initial negative reaction within 4 months from exposure to the cadaver,²¹ which is a large percentage of their study time during an academic year. Better preparation and debriefing for coping with dissection is required,¹⁹ as there is some evidence to

suggest that individuals can be “inoculated” against the stressful effects of handling a dead body.²²

The notion that work or study with an emotional content is in some way psychologically draining may have intuitive appeal, but this is by no means clear. Further, it is important to acknowledge that many individuals enter what are often termed the caring professions *because* of the emotional content of the work and thrive in these seemingly stressful contexts (McGarvey et al.²⁰ suggest that the anatomy room is a positive learning experience for the large majority of students). The emotional valence of the work may be a key factor in pathways to harmful outcomes (such as burnout) or benevolent ones (such as thriving). The positive psychology movement that has emerged in the past decade emphasizes the importance of examining the full range of possible outcomes of stressful experiences on a continuum ranging from thriving to psychological distress. Thus, the identification of factors related to positive as well as negative outcomes is important for the design of effective interventions to reduce the adverse consequences of exposure to cadaver dissection. Unfortunately, much of the previous work in the area has focused on the emotional consequences of exposure to cadaver dissection rather than examining the appraisal process that results from an encounter with cadaver dissection. The present study examines the relationship between the students’ appraisal of the transaction that takes place in the anatomy room and the association between the appraisal outcome and various psychological and personal factors. The aim of the study is to identify students who require an intervention to desensitize them to the anatomy room environment, thereby increasing their potential for learning in this situation. More specifically, the objectives of the study are:

1. To describe any adverse consequences of first exposure to cadaver dissection reported by the anatomy students both initially and four months later.
2. To describe the outcomes of the anatomy students’ primary appraisal of first exposure to cadaver dissection both initially and four months later.
3. To identify any correlates of stress outcome or appraisal among anatomy students after their first exposure to cadaver dissection.

Methods

All first year medical students were recruited from a university in Northern Ireland (the only university in Northern Ireland with a medical school) and a university in the Republic of Ireland (one of the five universities in the Republic of Ireland with a medical school). Consequently, the responses of the students are believed to

be typical of first year medical students in Ireland but, given that random sampling across universities was not employed, caution is advised in generalising the findings of this study beyond the universities included.

Students were recruited at the end of their first class in the anatomy room by the first author. Students had been informed of the project during this class. At the end of class, the first author (who has no involvement in the teaching of the medical students) further informed the students about the nature of the study and invited everyone to participate by completing a questionnaire. No incentives were provided to encourage participation other than emphasizing the value of the students' responses in helping to improve the experiences of future student cohorts. All participants were promised confidentiality and that data would be recorded anonymously (by the first author); other members of the research team and other members of teaching staff would not have direct access to the questionnaire responses, but the research team would be able to access computerized data, from which no individual could be identified.

Questionnaires were administered to consenting participants immediately after their first encounter with cadaver dissection (at the beginning of the semester) and approximately four months later (at the end of the semester). Data collection at the second time point followed the same procedure as data collection at the first time point. The questionnaire administered contained the following instruments:

- The Appraisal of Life Events Scale (ALE)¹⁰ [Appendix A], to assess the outcome of the students' primary appraisal in terms of threat challenge or loss. The three dimensions of the ALE Scale have good psychometric properties, with internal consistency estimates (using Cronbach's alpha) ranging from 0.75 to 0.87¹⁰ and have been used previously among medical students to examine their appraisal of exposure to cadaver dissection.²³
- The COPE scale²⁴ [Appendix B], to describe the coping strategies employed by students. This instrument assesses the extent to which the respondent engages in 15 different coping behaviors, both adaptive and maladaptive. Internal consistency estimates for these 15 different behaviors range from 0.62 to 0.92 (most are higher than 0.7).²⁴ The scale has been validated for use among undergraduate medical students²⁵ and has been used among medical students in an investigation of the impact of cadaver dissection.²⁶
- The Eysenck Personality Questionnaire (EPQ),²⁷ which describes the personality of the students on the dimensions of neuroticism, psychoticism and ex-

traversion. Extraversion refers to the extent to which an individual easily expresses emotions, is gregarious, does not like to be isolated; neuroticism refers to emotional instability, such as constantly worrying, being prone to changeable moods and feelings of nervousness, being easily upset; and psychoticism is concerned with an aggressive, antisocial nature, such as inappropriate expression of emotions, non-acceptance of cultural norms, recklessness and immaturity. The dimensions of the EPQ have been validated in 34 countries²⁸ and have been used previously among medical students.²⁹

- The Revised Collett-Lester Fear of Death Scale³⁰ [Appendix C], which provides scores on four subscales: attitudes towards your own death, attitudes towards your own dying, attitudes towards the death of others, attitudes towards the dying of others. Test-retest reliability estimates for these scales range from 0.79 to 0.86 and internal consistency estimates range from 0.72 to 0.91.³⁰ The validity of the scale has been demonstrated³¹ and it has been used previously with medical students.³²
- Demographic characteristics: sex, ethnicity, religious background, previous experience of dead people.
- Single-item, self-report of anxiety and nausea.

At the second point of testing, the questionnaires contained the ALE and the self-report of anxiety and nausea in retrospect. In addition, students were asked to indicate how nauseating or anxious they would feel about encountering cadaver dissection in the future, details about any adverse consequences they had experienced since their first encounter with cadaver dissection, and any suggestions which would make the encounter less anxiety-provoking.

Participants in the study were exposed to cadavers as part of their anatomy teaching on an undergraduate medical program. At time 1, students from both universities experienced their first class in an anatomy room and first exposure to cadaver dissection. This involved a demonstration (which involved dissection) by a lecturer as part of an introduction to human structure and function. Students had been informed what would happen during this class in a previous session but that description focused on the practical and organizational aspects of the class. During this class, students were not required to dissect the cadaver but to observe. They were also introduced to the cadaver that they would be dissecting in later classes. At the second time point, students had reached the stage of "hands-on" cadaver dissection.

Data collected at both points in time were compared using paired t-tests for continuous variables which dis-

played a normal distribution and Wilcoxon tests for categorical variables or continuous variables that were not normally distributed. Correlations were conducted using Pearson's product-moment correlation coefficient or its nonparametric equivalent (Spearman's rho). Differences between two groups were examined using Mann-Whitney tests, as data were either not normally distributed or the dependent variable was measured at the ordinal level. In all cases, the alpha value was set at 0.05.

Results

A total of 221 students completed the questionnaires immediately after first exposure to cadaver dissection, but only 193 of these students provided sufficient information to allow responses to be matched at the second point in time. At this second administration, 200 students completed the questionnaires, with 14 omitting information necessary for responses to be matched across time. Therefore, matched data across both times of testing was collected for 141 students.

The students who participated at both points in time were approximately 18.75 years old, on average (SD = 1.16). The sample is described in Table 1, which indicates that the students classified themselves as predominantly White-European and Christian. This limits the analyses (due to the small variance) that can be conducted using the variables "ethnicity" and "religious background".

Over 77% of the students (109/141) had been exposed to at least one dead person at some time in the past. In the majority of cases (85%) this was a relative.

Adverse Consequences of Exposure to Cadaver Dissection - On average, students reported that they felt

Table 1: Demographic characteristics of the students

		Frequency	Percent
Sex	Female	94	67.6%
	Male	45	32.4%
Ethnicity	White-European	127	90.1%
	Asian	6	4.3%
	Malaysian	3	2.1%
	Other	5	3.5%
Religious	Christian	110	78.6%
Background	Muslim	10	7.0%
	Scientology	1	1.0%
	No religious community	10	7.0%
	Atheist	9	6.4%

slightly anxious (median = 3 on a 0 to 10 scale) before their initial exposure to cadaver dissection. Over one-quarter of the students reported anxiety scores in the upper half of this scale and 12 students (8.5%) reported a score of 8 or more. A similar pattern was produced when students were asked to recall their feelings of anxiety four months later. Students also reported a low level of nausea (median = 1 on a 0 to 5 scale) on exposure to cadaver dissection, but again a minority (14.2%) reported feelings of nausea in the upper half of this scale and 9 students (6.4%) reported a score of 4 or more. When asked to reflect (four months later) on their feelings of nausea at the time of initial exposure to cadaver dissection, students recalled their level of nausea as significantly higher than recorded at the time ($Z = 3.763$, $p < .001$).

Almost 14% of students felt that they would experience high levels (i.e., in the upper half of the response scale) of nausea when faced with cadaver dissection in the future, and 6% of students indicated that they would experience high levels of anxiety in this situation.

A total of 44 students reported experiencing adverse consequences as a result of their initial exposure to cadaver dissection. Apart from nausea and anxiety, five students stated that they had considered leaving the course, as they thought they would not be able to cope with the dissection element; five students reported experiencing nightmares; four students reported a loss of appetite; three students reported thinking about death more often; two students reported that the image of the dissected body was constantly on their mind throughout the semester; and one student stated that she wept when she thought about the dead body.

Statistically significant positive correlations were found between the level of nausea experienced on initial exposure to cadaver dissection and the students' attitudes towards their own death ($r = 0.168$, $p = .022$) and between the level of anxiety experienced on initial exposure to cadaver dissection and neuroticism ($r = 0.293$, $p = .001$), attitudes to others' death ($r = 0.204$, $p = .022$), attitudes to others' dying ($r = 0.286$, $p = .001$) and the maladaptive coping strategies of "venting emotions" ($r = 0.191$, $p = .032$) and "denial" ($r = 0.220$, $p = .013$).

Table 2: Outcomes of Primary Appraisal

	Median (time 1)	IQR (time 1)	Median (time 2)	IQR (time 2)	Possible Minimum	Possible Maximum
Threat	4	7.5	6	7	0	30
Challenge	13	8	13	9	0	30
Loss	2	4.5	3	4	0	20

Primary Appraisal of Exposure to Cadaver Dissection - Table 2 demonstrates the extent of threat, challenge or loss that students experienced as a result of their primary appraisal of the transaction with initial exposure to cadaver dissection and how they felt about this experience four months later. There were no significant differences in the threat and challenge scores over time. The loss score showed a statistically significant increase from time one to time two ($Z = 3.163$, $p = .002$), but the change was small in magnitude.¹⁰ As the distributions for the threat and loss scores showed significant positive skewness at both points in time, the median and interquartile range values are reported for all of these variables. The results indicate that students found the experience mostly challenging and, on average, did not judge the transaction highly in terms of threat or loss. However, a small minority (15/141) appraised the situation as highly threatening, and an even smaller number (5/141) expressed strong feelings of loss.

Those who reported serious adverse consequences, such as experiencing nightmares and feelings of inability to cope, had non-statistically significant higher threat scores than other students (median = 11 vs median = 4; $Z = 1.871$, $p = .061$). The difference between these two median values represents a large difference in magnitude, the equivalent of just under 1 standard deviation of scores based on norms.¹⁰

The primary appraisal outcome of threat was significantly correlated (with an absolute coefficient of greater than 0.3) with feelings of nausea ($r = 0.385$, $p < .001$), feelings of anxiety ($r = 0.529$, $p < .001$), and neuroticism ($r = 0.316$, $p < .001$). Loss was significantly correlated with feelings of nausea ($r = 0.324$, $p < .001$) and feelings of anxiety ($r = 0.324$, $p < .001$). Challenge was not significantly associated with any other variable.

Females (median = 5) when compared to males (median = 3) perceived the transaction as significantly more threatening ($Z = 3.668$, $p < .001$), even though the difference was small. There were no statistically significant differences found for the challenge or loss outcomes.

Students "At Risk" - At the four-month point, students who reported that they were still experiencing adverse consequences of initial exposure to the cadaver dis-

section ($n = 10$) had significantly higher threat scores ($Z = 2.079$, $p = .038$) and significantly higher loss scores ($Z = 3.065$, $p = .002$); they were also significantly more anxious about their own death ($Z = 2.054$, $p = .040$) than other students. This pattern remained when the students who reported experiencing adverse consequences lasting any length of time were compared to the students who reported never experiencing adverse consequences.

Possible solutions suggested by the students to make the situation less anxiety-provoking are presented in Table 3. The suggestions most commonly made ($n = 66$) focused on easing the students into the dissection experience by providing detailed descriptions of the process and the likely emotional reactions that would be experienced and even by providing photographs of the situation.

Discussion

The findings are encouraging for the anatomy teacher. It is clear that the students found the experience mostly challenging, and few reported experiencing adverse consequences. This is a positive primary appraisal outcome for the vast majority of students. The transactional theories of stress suggest that this is unlikely to lead to a negative stress outcome. Other research suggests that perhaps students who expect to encounter cadaver dissection as part of their curriculum are more likely to perceive it as a positive experience.²⁰ Consequently, it is likely that many students undertake courses such as anatomy *because* they are people who perceive experiences such as cadaver dissection as thrilling and challenging. So, by making it clear that a course contains such potentially stressful situations, perhaps we are already encouraging a type of self-selection of students into these courses. Indeed, the proportion of students who reported adverse consequences of initial exposure to cadaver dissection in this study are similar to the proportions found in previous work.^{20,23,33}

Nevertheless, there are some students who experience serious difficulties as a result of this part of their curriculum. An exploration of the responses provided by these students indicated that serious adverse consequences are associated with judging the transaction as threatening. This supports contemporary theories of stress and

Table 3: Students' Suggestions for Reducing Anxiety

	Frequency	Percent of responses (n = 73)*	Percent of total (n = 141)*
Describe the process in detail in advance	20	27.4%	14.2%
See photographs in advance	15	20.5%	10.6%
Describe the smell and "feel" of the cadaver in advance	13	17.8%	9.2%
Reduce the amount of build-up / waiting time between entering the anatomy room and seeing the cadaver	7	9.6%	5.0%
Watch an initial demonstration without touching the body	6	8.2%	4.3%
Have a good tutor as a guide	6	8.2%	4.3%
Gradually uncover the body	6	8.2%	4.3%
Mask the smell	5	6.8%	3.5%
Have more previous exposure to organs	4	5.5%	2.8%
See a video in advance	3	4.1%	2.1%
Explain that feelings of nausea/anxiety are normal	3	4.1%	2.1%
Have a whole body at first	2	2.7%	1.4%
Make the room less cold and eerie	1	1.4%	1.0%

*Column does not add to 100%, as some students made more than one suggestion.

appraisal, which suggest that the primary appraisal outcome is a main determinant of the consequences of the transaction.⁸ The present study aimed to identify students who would experience adverse outcomes and/or would perceive exposure to cadaver dissection as threatening on the basis of several individual differences variables which were considered likely to be important – personality, death anxiety, coping strategies, sex and previous exposure to dead people. There was some suggestion that neuroticism, attitude to others' dying and attitude to own death may be associated with students' reactions to cadaver exposure.

Attitude to others' dying taps into issues such as seeing the physical degeneration of a dying person's body and being reminded that you will also go through this experience. Attitude to own death explores areas such as how you will feel when you are dead and your feelings about the shortness of life. These issues may be particularly pertinent for students when faced with cadaver dissection for the first time, and it is to be expected that students who are very concerned about these issues are also most likely to find the experience troublesome. Death anxiety (of which attitude to others' dying and attitude to own death are considered components) has been found to be significantly lower among undergraduate medical students than in the general population.³⁴ so again this may be an important deliberation for students' self-reflection when they are considering to which undergraduate program they should apply.

Neuroticism describes the personality characteristic of emotional sensitivity, such as constantly worrying, being prone to changeable moods, feelings of nervousness, easily upset, etc. Students who scored high on this dimension are most likely to appraise their initial exposure to cadaver dissection as threatening; again, this finding follows the expected direction. However, it must be noted that the association between stress outcomes and neuroticism and attitude to others' dying was not strong, and much of the variance in primary appraisal and adverse outcomes is left unexplained by the variables included in this study. Therefore, further work is required to identify which variables may play an important role if we are to accurately identify the students "at risk" and introduce an intervention at an early stage. A qualitative study is called for, perhaps using focus group methodology, to identify relevant predictor variables which can then be tested in a formal quantitative model.

Although the present study was not able to identify strong individual correlates of upsetting experiences resulting from initial exposure to cadaver dissection, there were several suggestions made by the students about how the experience could be viewed more positively. The most common suggestion was that students should be taken through the process in a more gradual manner. There is some research to suggest that it is possible to desensitize individuals to the distressing experience of dealing with a dead person,²² and the students in the present study are

hinting at such an approach. It appears that the anatomy room experience could be made less anxiety-provoking for many students if there was a detailed description of the process provided in advance in a separate room. This description should involve information about the smells and sights and about the nature of the environment, in addition to reassuring the students that it is acceptable to feel nausea and leave the room. Such a description could be enhanced by photographs or perhaps even a video of the dissection process. This type of approach would reduce the likelihood of students engaging in avoidant coping strategies such as "denial". As reported, the use of such coping strategies among this group of participants was positively related to feelings of nausea after first exposure to cadaver dissection. Therefore, encouraging students to confront the reality of the anatomy room situation but via a method which is less anxiety-provoking than the real situation is likely to result in a reduction in the use of coping strategies that are inappropriate and that result in heightened adverse stimulation when the situation can no longer be avoided. Undoubtedly such an approach would not be detrimental to any students and may help to ease the process for a large number of participants. Therefore, this process could be adopted for the entire student group, thus negating the need to find methods of identifying students who were particularly at risk. Perhaps institutions could formulate a policy where a video room could be booked by students to watch a recording of a cadaver dissection as many times as required until they felt comfortable to face the "hands-on" scenario. In this way, those students "at risk" could bring themselves to the intervention rather than trying to identify the students to whom the intervention should be introduced.

In summary, this study found that serious adverse consequences of initial exposure to cadaver dissection were experienced by only a small proportion of students. Unfortunately, none of the variables included in this study were strong predictors of adverse outcomes. Nevertheless, the inability to profile "at risk" students may be less of an issue if the suggested intervention is adopted by institutions.

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